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Good, Bad, and Ugly Colonial Activities:

Studying Development across the Americas

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Abstract

Levels of economic development vary widely within countries in the Americas. This paper argues that part of this variation has its roots in the colonial era. Colonizers engaged in different economic activities in different regions of a country, depending on local conditions. Some activities were "bad" in the sense that they depended heavily on the exploitation of labor and created extractive institutions, while "good" activities created inclusive institutions. The authors show that areas with bad colonial activities have lower gross domestic product per capita today than areas with good colonial activities. Areas with high pre-colonial population density also do worse today. In particular, the positive effect of "good" activities goes away in areas with high pre-colonial population density. The analysis attributes this to the "ugly" fact that colonizers used the pre-colonial population as an exploitable resource. The intermediating factor between history and current development appears to be institutional differences across regions and not income inequality or the current ethnic composition of the population.

This paper—a product of the Finance and Private Sector Team, Development Research Group—is part of a larger effort in the department to understand the role of history and institutions in the development process. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at mbruhn@worldbank.org.

Good, Bad, and Ugly Colonial Activities: Studying Development across the Americas[1]

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1 Introduction

Levels of economic development vary widely between and within countries. In a sample of eight of the largest countries in the Americas, the richest country (the US) has six times the GDP per capita of the poorest country (Venezuela). Similarly, within these countries, the richest state has on average seven times the GDP per capita of the poorest state[1]. Many recent papers have argued that the variation in economic development across countries is due to differences in institutions (See Pande and Udry, 2005, for an overview of this literature). However, few papers have studied why economic development varies so widely within countries[2].

At the cross-country level, Acemoglu et al. (2001, 2002) provide evidence that colonial factors can explain differences in economic development. They argue that, depending on the local conditions, colonizers either set up extractive or inclusive institutions in a given country. These institutions persisted over time and influence economic outcomes today. Glaeser et al. (2004) argue that the colonizers brought with them many other things, such as human capital, which could also explain the effect of history on current levels of development.

This paper uses a related argument to explain within-country variation in economic development across the Americas. Colonizers engaged in different economic activities in different regions of a country. We claim that some of these activities were "bad" since they tended to create extractive institutions and encouraged fewer Europeans to settle in the area due to the fact that the production technology was inherently repressive. These activities are plantation agriculture involving slavery and other forms of coerced labor (sugar, cotton, rice, and tobacco) and mining. Other activities were "good" and created inclusive institutions and encouraged more Europeans to settle since most individuals performing these activities stood on an equal footing. Independent of the economic activity, extractive institutions were also created in areas that had high pre-colonial population density. In these areas, the colonizers often used the native population as an exploitable resource (which was an "ugly" activity).

We then argue that institutions created during the colony persisted over time and

[1]Comparisons are based on data for Argentina, Brazil, Chile, Colombia, Mexico, Peru, the US, and Venezuela.

[2]Recent papers providing institutions-related explanations for within-country variation in development include Banerjee and Iyer (2005), Banerjee, Iyer and Somanathan (2005), and Iyer (2005) for India; Rosas and Mendoza (2004) and Bonet and Meisel (2006) for Colombia; Naritomi, Soares, and Assunção (2007) for Brazil; Merrouche (2007) for Algeria; Huillery (2007) for French Africa; Acemoglu et al. (2005) and Tabellini (2007) for Europe; and Mitchener and McLean (1999 and 2003) for the US.

affect current economic outcomes[3]. Areas with bad colonial activities should thus have lower levels of economic development than areas with good colonial activities, which included many other economic activities that did not rely on coerced labor. Similarly, areas with high pre-colonial population density should have lower levels of economic development today.

This line of argument is not entirely new and is largely based on Engerman and Sokoloff (1997 and 2002) and Acemoglu et al. (2001, 2002, and 2005). The contribution of this paper is mainly two-fold:

1. We extend the previous arguments to explain within-country variation in levels of economic development. We present both anecdotal and empirical evidence supporting a within-country correlation between colonial activities and development today. In addition, we provide indirect evidence suggesting that institutions are the mechanism through which history affects current levels of economic development.

2. We argue, in contrast to Engerman and Sokoloff, that having good colonial activities did not always lead to a good development path. Instead, the technologies used in different areas with good activities were endogenous to the availability of a local labor force. Areas suitable for good activities that had low pre-colonial population density followed the predictions of Engerman and Sokoloff in terms of creating a big middle class based on a disperse property structure. However, areas suitable for good activities that had high pre-colonial population density tended to feature exploitation of labor and have a high concentration of income. Some areas that had good activities thus also had ugly activities.

We collect data on economic activities performed in different regions during the colonial period for 16 countries in the Americas.[4] Each region is assigned three dummy variables summarizing whether it had predominantly good, bad or no colonial activities. We also collect data on pre-colonial population density (mainly from Denevan, 1992 and the references therein). The paper then correlates these historical variables with two current measures of economics development for states or regions in the eight countries (PPP GDP per capita and poverty rates). The results show that, in 2000, pre-colonial population density is negatively and correlated with current GDP per capita. Going from the 25th percentile in pre-colonial population density (-0.97) to the 75th percentile

[3]For the purposes of this paper, we refer to institutions as bundle of variables that may affect long run development, including the availability of human capital.

[4]The sample includes data for Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, United States, Uruguay, and Venezuela.

(2.10) is associated with 24 percent lower GDP and 15 percentage points higher poverty rates than other areas. The evidence on the effects of areas with bad colonial activities relative to areas with no colonial activities is weaker: even tough these areas have 10 percent lower PPP GDP per capita and 13 percentage points higher poverty rates than areas with no colonial activities, the results are not statistically significant. However, when we compare areas with bad activities to areas with good activities we observe that areas with bad activities have about 15 percent lower GDP and 14 percent higher poverty rates than areas with good activities. In other words, the type of activity only has a significant effect on current day development *conditional* on being colonized.

Comparing the effect of good and bad colonial activities in areas with high and low pre-colonial population density confirms our hypothesis that good colonial activities were not always beneficial for economic development. In areas with low pre-colonial population density, areas with good colonial activities have higher levels of GDP per capita today than areas with bad colonial activities. But when good colonial activitis coincide with high pre-colonial population density, the positive effect of good colonial activities goes away. In these areas, levels of GDP per capita are similar to the ones of areas with bad colonial actitivies combined with either low or high pre-colonial population density. We thus find that having good colonial activities together with high pre-colonial population density had approximately the same impact on long run economic development as having bad colonial activities.

Next, we study the mechanism that relates history with current development. Our evidence indicates that formal institutions, and not income inequality or the current ethnic composition of the population, are an important mechanism to explain the effects of history on current development.

Overall, the results suggest that the conditions faced by colonizers (in terms of the size of the native population and the suitability for exploiting some minerals and cash crops) affected the characteristics of the social and economic institutions established in the past and this affects current development.

The paper is organized as follows. Section 2 discusses the theoretical background. Section 3 gives historical examples for the theory. Section 4 describes the data. Section 5 analyzes the relationship between colonial activities and development. Section 6 investigates the mediating factors between colonial activities and development today and Section 7 concludes.

2 Theoretical Background

In recent years, many studies have investigated the ultimate determinants of economic development. Acemoglu et al. (2001, 2002, 2005), Engerman and Sokoloff (1997, 2002), and Easterly and Levine (2002) argue that levels of economic development in New World countries go back to patterns of colonization. In particular, they argue that colonizers shaped the "institutions" of New World countries. These institutions have persisted over time and have affected long-run levels of economic development[5].

The types of institutions that Europeans set up in the countries they colonized can be classified into two categories - extractive institutions and extensive "neo-European" or inclusive institutions. Extractive institutions were intended to transfer as much as possible of the resources of the colony to the colonizer (p. 1370, Acemoglu et al., 2001). This colonization strategy did not require the introduction of extensive civil rights, protection of property rights, checks and balances against government power. It also did not require a large number of Europeans to immigrate to the colony. This strategy therefore discouraged investment in physical and human capital and had a negative impact on long run levels of development. Setting up inclusive institutions, on the other hand, implied putting into place constraints on government expropriation, an independent judiciary, property rights enforcement, equal access to education, civil liberties, and unrestrained immigration from Europe, thereby allowing Europeans to settle and thrive. Inclusive institutions lead to high long-run levels of development.

Colonizers established extractive institutions in places where the net benefits of having extractive institutions exceeded the net benefits of setting up inclusive institutions. Three factors played a major role in determining the net benefits of institutions. The first factor was settler mortality (Acemoglu et al., 2001). The higher the expected settler mortality, the lower the probability of reaping future returns of establishing inclusive institutions. The second factor was pre-colonial population density (Acemoglu et al., 2002, and Engerman and Sokoloff, 1997 and 2002). The higher the population density, the higher the supply of labor that could be forced to work for the colonizers, making extractive institutions more profitable and leading to the concentration of political and economic power in the hands of small elites. Moreover, more prosperous and numer-

[5] The argument that economic development depends on institutions goes back to North and Thomas (1973) and North (1981). There are several reasons why institutions may persist over time. In fact, ruling elites replacing colonial powers after independence tended to maintain the same institutional setting. As documented in Acemoglu and Robinson (2006), in some countries, the elites controlling political power were the same even well after the independence. There are a number of mechanisms leading to inertia, even of inefficient institutions, as discussed in Acemoglu et al., 2005 and modeled in Acemoglu et al., 2007 for the case of the emergence and persistence of inefficient states.

ous societies probably had more structured tax systems (Engerman and Sokoloff, 1997 and 2002), implying that colonizers could take control more easily of the systems to extract resources. The third factor was the natural environment for activities with strong economies of scale (Engerman and Sokoloff, 1997 and 2002). The higher the suitability to exploit economies of scale, the higher the net returns of extracting current resources.

Acemoglu et al. (2001 and 2002) present cross-country evidence supporting the first two factors. They show that potential settler mortality and pre-colonial population density affected European settlements. European settlements in turn affected the characteristics of early institutions. These institutions have persisted to the present and have influenced levels of economic development. Engerman and Sokoloff (1997 and 2002), in turn, examine the importance of the third factor, the natural environment of the colonies, as well as the second factor, population density. They point out that the New World countries that were the richest in the early years of colonization have nowadays fallen behind in terms of economic development. They argue that differences in "factor endowments" led to different degrees of initial concentration in wealth, in human capital, and in political power. This initial inequality influenced the type of institutions set up in a given country. Inequality and institutions persisted over time and lead to different levels of economic development in the longer run.

The factor endowments discussed in Engerman and Sokoloff consist of the natural environment and pre-colonial population density. More precisely, they can be summarized by three factors: soil, climate, and the size and density of the native population (labor supply). The availability of these three factors led to the use of different production processes in different colonies. Engerman and Sokoloff identify three kinds of countries that used different production processes as determined by their factor endowments. First, there is a group of colonies that can be exemplified with Brazil and some Caribbean islands that had soil and climate suitable for producing sugar and other crops characterized by extensive economies of scale (cotton, rice, and tobacco). Given the efficiency of large plantations and the extensive use of slaves, economic and political power became highly concentrated in areas where these crops were grown. They argue that this concentration of power explains the evolution of institutions that commonly protected the privileges of the elite and restricted opportunities for the broad mass of the population.

The second group of countries corresponds to a number of Spanish colonies, such as Mexico and Peru, characterized both by the concentration of claims on assets in the hands of a privileged few (especially valuable natural resources) and abundant native labor. The consequent large-scale properties were to some degree based on pre-conquest social organizations in which the elites charged taxes. These large-scale structures, legitimated by the Spanish Crown (through the so-called encomiendas), survived even when the main production activities did not display economies of scale. The key aspect was that the rights to operate the tax systems were assigned to a small group of people. Hence, as in the previous group of countries, these economies featured highly concentrated political and economic power that translated into exclusive institutions preserving the power of the elite.

Finally, the third group of countries is composed of the colonies of the North American mainland (Canada and United States). These economies were neither endowed with crops that displayed economies of scale nor with an abundant native population. Therefore, their economies were organized into small units of production in a relatively competitive environment. The existence of abundant land and low capital requirements implied that most adult men operated as independent proprietors creating a relatively egalitarian society in economic and political terms.

Engerman and Sokoloff illustrate with a number of examples and summary statistics that the differences in productive processes across New World countries translated into very different patterns of suffrage, public land, schooling policies, financial policies, and innovation policies among these countries. Easterly (2001) and Easterly and Levine (2002) provide econometric evidence linking factor endowments to institutional development. Both papers use a group of 11 dummy variables indicating whether a country produced any of a given set of leading commodities (crops and minerals). Easterly (2001) uses cross-country data to relate these measures, jointly the settler mortality variable from Acemoglu et al. (2001), to a variable measuring the "middle-class consensus" (i.e. the share of the three middle quantiles in total income). He shows that factor endowments and settler mortality are correlated with the middle class consensus. The middle class share subsequently affects the level of schooling, institutional quality, and openness of countries, and these variables affect per-capita income. In a related cross-country study, Easterly and Levine (2002) correlate factor endowments and settler mortality with the development of institutions. They find evidence that these variables affect income only through institutions.

Overall, the existing literature indicates that colonial factors can explain differences in economic development across countries. However, they are relatively silent about the effects of colonial factors on institutions and development at the sub-national level. In particular, if one takes the papers by Acemoglu et al. literally, colonial factors created *homogeneous* national institutions. In turn, Engerman and Sokoloff stress institutional differences between the North and the South of the US, but they do not generalize the argument for other countries in the Americas[6]. Levels of economic development, however, vary as widely across regions within a country as they vary across countries. Table 1 shows a summary of GDP per capita (PPP) in different regions in 16 countries in the Americas. For some countries, the standard deviation of GDP per capita within country is almost as big as the standard deviation of GDP per capita across countries, which is equal to 0.65 in our sample.

This paper builds on the arguments developed by Acemoglu et al. and Engerman and Sokoloff to explain differences in economic development across regions within countries[7]. We point out that the local conditions faced by colonizers typically varied across regions within a country. The productive activities performed by colonizers thus also varied across regions. In fact, the three types of scenarios that Engerman and Sokoloff describe for countries were often present in different regions within the same country. Based on this, we argue that current levels of development within-country can be explained by differences in colonial activities[8].

We classify the colonial activities performed in a region into four possible categories. First, some areas had "bad" colonial activities. These activities were mining and sugar, cotton, rice and tobacco plantations. They were bad in the sense that they depended heavily on the exploitation of labor and created extractive institutions[9]. Second, other

[6]Engerman and Sokoloff briefly mention that countries with good endowments tend to have more dencentralized political institutions (Gallego, 2006, provides evidence supporting this idea). But they do not discuss the implications that decentralization of political power may have for development at the sub-national level.

[7]One concern with going from the cross-country level of analysis to the within-country level is that labor mobility is much greater within country. However, our aim is to explain existing current differences in economic development across regions that have clearly not been arbitraged away by migration. We view institutions as social arrangements specific to a region that are largely invariant to migration (this is related to the argument of persistence explained earlier in this section).

[8]Several recent studies examine the effect of different historical events on long-run development within countries. Banerjee and Iyer (2005) show that land revenue systems established in the colony affect long-run property ownership and development across Indian districts. In a related paper, Iyer (2005) finds that the form of British administration in different Indian areas has significant effects on current levels of development. Similarly, Rosas and Mendoza (2004) and Bonet and Meisel (2006) provide evidence that the patterns of (forced) settlement of slaves during the colony in Colombia are correlated with current patterns of development. In addition, as previously mentioned, many papers discuss differences of development between the North and South of the US (e.g. Engerman and Sokoloff). Interestingly, the effects of historical factors on development seem to be relevant not only among former colonies, but also in Europe. Acemoglu et al. (2005 and 2007) show that both the expansion of transatlantic trade and the Napoleonic invasions have a long-run effect on development at the regional level in Europe.

[9]Note that the silver mines common in Spanish colonies were typically large operations employing many slaves for at least two reasons. First, silver was found in sub-surface mines, leading to economies

areas had “good” colonial activities, such as wheat production and cattle raising. Third, some areas had “ugly” colonial activities, in the sense that the colonizers heavily subjugated and exploited the local pre-colonial population. Fourth, some areas were not reached by the colonizers and therefore had no colonial activities.

Our argument differs from Engerman and Sokoloff in that we claim that having good colonial activities did not always lead to a good development path. Instead, the technologies used in different areas with good activities were endogenous to the availability of a local labor force. Areas suitable for good activities that had low pre-colonial population density followed the predictions of Engerman and Sokoloff in terms of creating a big middle class based on a disperse property structure (as in the textiles or cattle areas in New England). However, areas suitable for good activities that had high pre-colonial population density tended to be dominated by exploitation of labor creating a high concentration of income. Examples are textile production in *obrajes* in Arequipa or cattle raising in many haciendas in Latin America.

Some areas that had good activities thus also had ugly activities. In contrast, bad activities such as mining or sugar production were highly profitable and had less flexibility in terms of technology adoption since the technologies depended heavily on economies of scale. In these cases the technologies used depended less heavily on the availability of local labor because labor could be imported from other areas, using slavery, personal service or the *mita* system.

In sum, the main hypotheses we test in this paper are the following

- Differences in current levels of development within countries can be explained by differences in colonial activities.
- More specifically, the abundance of local labor (measured by pre-colonial population density) and the existence of bad activities (such as mining and cultivation of sugar or cotton) have a negative impact on current levels of development.

of scale in production. Second, purifying silver required mercury. There were only two mercury mines in the world, one in Peru and one in Spain. Both were controlled by the Spanish crown and corruption and favoritism determined who got mercury in times when it was scarce. Many smaller mines had to close their operations since they often could not get mercury (Cumberland, 1968). In Brazil, on the other hand, mining focused on gold found in rivers, making it easier to enter into this industry with little wealth. As explained in Naritomi, Soares, and Assunção (2007), most miners held slaves in Brazil, but the owner-slave relationship was of a different nature. Slaves had the possibility of hiding the gold they found, forcing the owners to grant them more favorable conditions. In fact, slaves where often able to accumulate enough wealth to eventually buy their freedom. Naritomi, Soares, and Assunção mention, however, that gold mining in Brazil was characterized by rent-seeking and a heavy bureaucracy, leading to bad governance practices in these areas and thus also to lower levels of current economic development. For the purpose of this paper, we abstract from this different channel and group it with the general channel which we call ”institutions”.

- The link between colonial activities and current levels of development are institutions. Colonial elites created institutions that benefitted predominantly the elites and not the population at large. These institutions persisted over time, and account for the lower level of economic development today.

In relation to the last point, note that we refer to institutions in a broad sense (i.e. including government policies, such as access to education and to finance, as described in Engerman and Sokoloff, 1997 and 2002). The previous literature has often referred to institutions as constraints on the government and security of property rights and has argued that these particular institutions drive economic growth. However, this literature has emphasized the importance of institutions at the national level. At the subnational level, constraints on the government may be less important, since these constraints typically relate to the central government only, and policies and regulations may be more important[10]. Clearly, regions within a country are subject to many common policies and regulations set by the central government. However, in many countries, regions also set their own local policies. Moreover, the way in which *de jure* national policies and regulations are applied and enforced locally often varies, implying that *de facto* institutions could be different. For example, Almeida and Carneiro (2007) document that enforcement of labor regulation varies widely across cities within Brazil and that areas with stricter enforcement have higher unemployment. Laeven and Woodruff (2007) exploit the fact that state laws and also legal enforcement differ from state to state in Mexico to show that average firm size is larger in states with more effective legal systems.

3 Historical Background

This section illustrates the hypotheses put forward in Section 2 with specific examples. First, we consider examples that compare states within the same country in terms of their colonial activities and their current economic outcomes. These examples also discuss the institutional framework that may link current levels of development to colonial activities. Second, we consider an example in which the same activity (textile production) was developed in different regions using completely different technologies depending on the availability of labor. And, finally, we provide an example in which the initial development of an activity, (gold mining) using slaves led to the development of another activity (sugar cultivation) using the same slaves.

In Section 2 we argued that plantation agriculture (sugar, cotton, rice, and tobacco)

[10] Glaeser et al. (2004) suggest that even at the national level policies favoring human and physical capital accumulation have a stronger influence on growth than contraints on the government.

performed by colonizers led to extractive institutions and to lower levels of development today. An example for this mechanism is the north-eastern region of Brazil which grew sugar during the colony. Nowadays this region corresponds to the states of Alagoas and Pernambuco. These states had very unequal societies during colonial times for two reasons. First, sugar plantations used slaves, leading to the importation and subjugation of many Africans. Second, since sugar areas were rich areas, they attracted more rich people from the European elites. The sugar regions developed societal norms (institutions) that benefited only the elites and that did not leave room for the natives or slaves. The following quote from *Colonial Brazil* describes society in the sugar regions

"While the old planter families tended to intermarry, room was always found for sons-in-law who were merchants with access to capital or high-court judges and lawyers bringing prestige, family name, and political leverage. Obviously, the arranged marriage was a key element in the strategy of family success." (Bethell, 1987, p. 89)

In contrast to this elite dominated society stood São Paulo (formerly São Vicente), a region that was not favorable to growing sugar. The region was poor during the early years of the colony and displayed a very different societal structure. "Few Portuguese women were attracted to the area and the Portuguese households and farms were filled with captive and semi-captive Indians. Illicit unions between Portuguese men and Indian women were common and a large number of mamelucos (the local term for mestiços[11]) resulted. [...] In the early period of São Vicente's history, little discrimination was made between mamelucos and Portuguese so long as the former were willing to live according to what passed in the region for European norms." (Bethell, 1987, p.111-112) Colonial society in São Paulo was thus comparatively inclusive. Societal norms (institutions) benefitted a larger set of people than in the sugar regions.

Although Alagoas and Pernambuco were rich states during colonial times and São Paulo was poor, their fortunes are now reversed. In 2000, PPP GDP per capita in Alagoas was US$ 2,809 and US$ 3,531 in Pernambuco. In São Paulo, on the other hand, GDP per capita was US$ 11,718. Poverty rates show a similar pattern. In 2000, they stood at 46.5 percent in Alagoas (57.4 percent in Pernambuco) and 12.3 in São Paulo.

Section 2 also argued that areas with high pre-colonial population density developed extractive institutions during the colony and are therefore less developed today. This pattern is well illustrated by comparing two Mexican states, Aguascalientes and Tlaxcala. These states have similar background characteristics, but they had different pre-colonial population densities. Both states are landlocked and have similar average

[11]Mesitços are people of mixed Indian and European decent.

yearly temperatures and total rainfall. Aguascalientes had a pre-colonial population density of about 14, while Tlaxcala had a pre-colonial population density of more than five times this number (about 80). In 2000, PPP GDP per capita in Aguascalientes was US$ 11,558. In Tlaxcala it was US$ 4,873. In Aguascalientes, 13 percent of the population lived under the poverty line in 2000, but it was 26 percent in Tlaxcala.

The link between colonial activities and current level of development may be institutions. The Aguascalientes and Tlaxacla example is consistent with this hypothesis. A 2004 Moody's study creates an index of institutional quality (with respect to contract enforcement) for Mexican states. The index runs from 0 (weakest) to 5 (strongest). In this study, Aguascalientes obtained a value of 3.05, while Tlaxcala obtained 1.93. Similarly, according to the World Bank's *Doing Business in Mexico 2007* report, Aguascalientes ranked number one for ease of doing business. Tlaxcala, on the other hand, ranked number 22.

The contrasting organizational form in textile production in different regions provides an example of the mechanisms at work in our theory. Textile production in the colonial United States was organized in many small scale mills and shops under property ownership (McGaw, 1994, p. 396). In contrast, textile production in many Spanish colonies was organized in *obrajes de paño*[12]. Obrajes were large workshops that "integrated every part of the cloth production process" (Gómez-Galvarriato, 2006, p. 377). These workshops have been likened to modern day "sweat shops," and the labor force was based on coerced labor (slavery, mita, etc.). Interestingly, obrajes did not exist in Spain itself and were developed particularly for the colonies "with the techniques and experience of Spanish masters and artisans" (Gómez-Galvarriato, 2006, p. 377). Textile production in Spain was mainly organized in small shops, similarl to the United States. People from the same nation thus chose a very different production technology for producing the same product in different areas. Our hypothesis is that this technological choice was influenced by the availability of a coercible native population.

The obraje system had negative consequences for long-run development. Gómez-Galvarriato (2006) claims that the strong dependence on coerced labor destroyed incentives for the accumulation of human capital among workers and increased income inequality. It thereby contributed to the low levels of industrial development in many areas in Latin America over the XIX century.

Finally, the history of sugar cultivation in certain areas of Colombia provides an

[12] Accordingly to Gómez-Galvarriate, obrajes were widely present in Latin America since the mid XVI century, including places such as Puebla and Michoacán in México, Cuzco, Cajamarca, and Huanuco in Perú, Quito in Ecuador, La Paz in Bolivia, and Córdoba in Argentina.

example for persistence of economic and social institutions. The Pacific lowlands of the Chocó region had significant gold mining activities during the early colonial period. Gold production relied strongly on slaves. McFarlane (2002) and Ocampo (1997) document that, after many of the gold reserves were depleted, slave owners moved slaves from the Chocó region to sugar plantations in the neighboring Valle del Cauca and Cauca regions. In this case, an activity that involved the importation of slaves seems to have affected the development of another activity using the same labor intensive technology.

Nowadays, Colombian regions that had mining activity or sugar cultivation during the colony have an average PPP GDP per capita of US$ 5090. Regions that had other activities, not using slave labor, or that had no activities today have an average PPP GDP per capita of US$ 13,324.

4 Data

We constructed a data set that covers 332 regions from 16 countries in the Americas. This section discusses general features of the data and data sources. A more detailed description of the data is in the appendix. Appendix A presents the definitions of all variables. The sources for each variable are listed in Appendix A Table 1. A companion dataset reports the values of the pre-colonial population density and colonial activities data for each region.[13]

4.1 Measures of Economic Development

The main outcome variable of our analysis is the current level of economic development of each department, province, region, or state in the data set[14]. This paper uses GDP per capita to measure economic development. Moreover, we also use poverty rates at the state level to measure economic development. Summary statistics for these two variables are in Table 2. The data on GDP per capita and poverty rates comes from country specific sources. GDP by state come mostly from the statistical agency of each country, which reports GDP by region. For El Salvador, Guatemala, Honduras, and Paraguay, data on per capita GDP at the state level come from national Human Development Reports for each country. For all countries, data on population and poverty rates come from each country's demographic census or from household surveys. We try to use definitions that are compatible across countries to the largest extent possible. Here we briefly mention some exceptions, which are discussed in detail in Appendix A.

[13]The dataset is available on-line at http://www.economia.puc.cl/fgallego

[14]In this paper, we use department, province, state, and region interchangeably.

In terms of per-capita GDP, the most important deviation occurs for Venezuela. To our knowledge, GDP is not available at the region level. Thus, we use per-capita income at the region level from a household survey.

We define poverty rates according to the national definition of poverty lines. This may produce poverty rates that are not comparable across countries. To deal with this potential problem, we run regressions using the log of our measures of development, and we include country fixed effects. This way, the variables used in the regressions (and the estimated effects) can be interpreted as log deviations from country means.

The outcome data we use is generally for the year 2000 (or for a year close to that if data for 2000 was not available). For some countries, such as the US, it is a well known fact that levels of economic development across regions have converged quite significantly over the past few decades[15]. This implies that our estimates provide a lower-bound on the effect of colonial activities. It would be interesting to replicate the results with earlier data to see how they change over time, but data at the state level is not available for earlier periods for many of the countries in our sample.

In addition to measures of current economic development, we also use a proxy for pre-colonization levels of development. This proxy is a pre-colonization health index that comes from the Backbone of History Project (Steckel and Rose, 2002). Steckel and Rose estimate a health index that goes from 0 to 100 based on archeological data. For this paper, we match the location of the archeological sites to regions within countries. This allows us to obtain information for 52 regions in our sample. As explained in more detail in the empirical section below, we also include information on the estimated year to which the archeological samples belong.

4.2 Colonial Activities

We construct three variables capturing colonial activities. First, we construct a measure of population density before colonization at the region level using several sources. The information comes mainly from the chapters and references in Denevan (1992). Denevan provides estimates of the total native population for each country. For some countries, he also provides estimates of the native population for regions within a country. Whenever this is not the case, we complement this information with several other sources to arrive at estimates of population density at the region level. Here, we lay out the main features of this variable. Appendix B describes in more detail how the variable was constructed.

[15] Iyer (2005) also shows that the effect of colonialism in India was stronger at the time of independence than in the 1990s.

The quality of the information on pre-colonial population density at the regional level varies across countries and regions. For Argentina and the United States, Denevan (1992) provides detailed information that allows us to construct measures at the state level. For Bolivia, Brazil, Ecuador, and Mexico, Denevan provides information for the main geographic regions of the countries, and we match all current states to those regions. For Colombia and Perú, we use a similar procedure, but the basic information comes from Ocampo (1997) and Villamarín and Villamarín (2000) for Colombia and Cook (1981) for Perú. For the remaining countries, the information is sparser, and we have to rely on complementary sources. For Chile, Denevan provides information for the main native group, the *Araucarians*. We complement this with information for other main groups imputing population density estimates for a) the border regions of Argentina, for some groups that lived in the North (the *Diaguitas*) and the South (several peoples living in and to the South of Patagonia) and b) the border regions of Perú, for some groups that lived in the North (some groups linked to the Incas). The procedure for Paraguay, Uruguay, and Venezuela is similar. Here, we use some information available from Denevan and we impute information for regions in neighboring countries (Colombia and Brazil for Venezuela; Argentina and Brazil for Uruguay; and, Argentina, Bolivia, and Brazil, for Paraguay). For Central American countries, Denevan (1992) reports the areas in which the native population lived before the arrival of the colonizers and we match the implicit population density to current-day states belonging to these areas. The estimated native population density varies from 0.01 people per square meter in the Southern regions of Argentina and Chile to 392 in Mexico City.

Our other two colonial variables are dummy variables related to the main economic activity performed during colonial times in difference regions. We first identify the main economic activity using history books for each country[16]. Next, we classify the activities in good and bad activities following Engerman and Sokoloff. Bad activities include mining, rice, sugar and tobacco cultivation. Good activities include all other agricultural activities, cattle, livestock, fishery, trade, naval stores, ports, textiles, and wine production. Based on this classification, we construct two dummy variables. The first one indicates whether a region had good colonial activities. The second one indicates whether a region had bad colonial activities. Some regions did not have any activities since the colonizers did not reach them. The category "no activities" is the omitted category in our regressions. The summary statistics in Table 2 show that 47 percent of all areas had good colonial activities, 22 percent had bad colonial activities and 31

[16]The Appendix presents a detailed description of the sources by country.

percent had no colonial activities. The corresponding percentages for the 8-country sample are 49, 25, and 26 percent.

4.3 Intermediating Factors and Control Variables

We complement the previous information with a number of current variables that may have been affected by colonial activities and that may be the link between those activities and current levels of economic development. The first of these variables is a measure of income inequality, the Gini index[17]. Data on the Gini index come from local statistical agencies and in some cases from household surveys. The second variable is the share of the population that is native or black.[18] Data on the ethnic composition of the population typically come from the demographic census of each country. However, there is heterogeneity in the way this variable is measured in different countries and surveys. For example, in most countries, the surveys ask the respondents about their ethnicity. For Mexico and Peru, however, the census instead asks whether the respondent speaks a native language. We take this as a proxy for the share of the native population. Other differences in the data across countries are discussed in Appendix A.

Finally, we also include control variables in the regressions to control for regional differences in climate and geography. The climate variables are average temperature and rainfall at the region level. The climate data typically comes from each country's statistical agency or meteorological institute. The geography variables are altitude and a dummy variable indicating whether the region is landlocked.

Table 3 shows how the colonial activities dummies are correlated with pre-colonial population density and with the control variables in our full sample. Areas that had high pre-colonial population density are more likely to have good activities and are less likely to have no activities. Average temperature is positively correlated with good activities and negatively correlated with bad activities. Landlocked areas are less likely to have bad activities and more likely to have no colonial activity.

5 The Effects of Historical Factors on Development

Section 2 argued that high pre-colonial population density and bad colonial activities are correlated with lower levels of current economic development. We test these hypotheses by running the following reduced form regression

$$Y_{rc} = \mathbf{Z}_{rc}^{'}\alpha + \mathbf{X}_{rc}^{'}\beta + \eta_c + e_{rc}, \tag{1}$$

[17]This variable is not available for Honduras, Panama, Paraguay, and Uruguay.

[18]These variables are not available for El Salvador, Honduras, Panama and Paraguay.

where c refers to country, r refers to region, Y is a measure of development, $\mathbf{Z}$ is a vector of historical variables, $\mathbf{X}$ is a vector of control variables, η is a country fixed effect, and e is the error term.

The set of historical variables, $\mathbf{Z}$, includes pre-colonial population density and dummies for colonial activities that were, according to our hypothesis, more or less favorable to development ("good" and "bad" colonial activities, with no activities being the omitted category). The control variables, $\mathbf{X}$, consist of climate and geography variables. The standard errors are clustered at the pre-colonial population density level. The reason for clustering at this level is that, as discussed in Section 4, in some cases, we impute the same value for more than one region due to missing information.

We test the hypotheses stated in Section 2 in three separate regressions. First, we run regression (1) including only pre-colonial population density in the historical variables Z. According to our hypotheses, the coefficient on Z, α, should be negative. Then, we leave out pre-colonial population density and include only a good activities dummy and a bad activities dummy in the set of historical variables Z. The coefficient on bad colonial activities should be negative, and the coefficient on good colonial activities should be zero in this regression. The reason for the zero effect of good activities is that although good activities *per se* should have a positive effect, areas with good activities are also more likely to have high pre-colonial population density on average (as shown in Table 3), counteracting the positive effect. When we control for pre-colonial population density and the type of activity in the same regression, the coefficient on good activities should become positive.

In each regression, we test for the equality of the coefficients on the good and bad activities dummies. The hypotheses imply that areas with bad activities should have statistically significantly lower levels of economic development than areas with good activities. Another way of testing this hypothesis to run the regression for the sample of regions that had colonial activities, excluding the ones that did not have any activities. Here we again expect the coefficients on pre-colonial population density and on bad colonial activities to be negative.

First, we consider regressions for log GDP per capita (PPP). The regressions of current log GDP per capita on historical variables are in Table 4. Column 1 of Table 4 includes only pre-colonial population density as a regressor, without control variables. Pre-colonial population density is negatively and significantly related to current GDP per capita. The coefficient of -0.078 implies that going from the 25th percentile in log pre-colonial population density (-0.97) to the 75th percentile (2.10) is associated with

24 percent lower GDP[19].

Column 2 of Table 4 includes only the good colonial activities and bad colonial activities dummies. The omitted dummy is no colonial activities. Areas that had good activities are not significantly different from areas with no activities in terms of current GDP per capita. Areas that had bad colonial activities, however, have 17.8 percent lower GDP per capita today than other areas. The next column of Table 4, Column 3, includes all historical variables together as regressors. The coefficient on pre-colonial population density remains largely unchanged. As predicted, the coefficient on the good activities dummy now becomes positive, but it is still not statistically significant. The coefficient on bad colonial activities becomes smaller and loses significance.

Columns 4 and 5 add the set of controls to the regression step by step. First, Column 4 includes climate variables - average yearly temperature and total rainfall and both of these variables squared. The temperature variables are not statistically significant. Rainfall, on the other hand, is negatively correlated with GDP per capita. When including the temperature variables, the coefficient on pre-colonial population density remains significant and negative. The coefficient on good activities is still not significant and the coefficient on bad activities now increases in magnitude but it is still statistically insignificant. This is also is true when we add geography variables, which are not statistically significant. Column 5 shows this regression. The control for being in a landlocked region controls for access to the sea and therefore works as a proxy for transportation costs that could generate a number of negative effects on trade and development (See Frankel and Romer, 1999, Irwin and Tervio, 2000, and Spolaore and Wacziarg, 2005). We find a negative, but statistically insignificant, effect.

Although most of the regressions in Table 4 don't detect a statistically significant different between areas with bad colonial activities and areas without any colonial activities (the omitted category), the F-tests in the lower panel show that areas with bad colonial activities have about 14 percent lower GDP per capita than areas with good

[19] A negative coefficient on pre-colonial population density in this regression could also be due to convergence if the pre-colonial production function was $Y = L^{(1-\alpha)}N^{\alpha}$, where L stands for land and N stands for labor and if there were a convergence process of the form: $\log(Y_t/N_t) - \log(Y_0/N_0) = -\lambda \log(Y_0/N_0)$, where t stands for the current period, 0 for the past, and λ is a function of the speed of convergence. In this setup we get that: $\log(Y_t/N_t) = -\lambda(1-\alpha)\log(N_0/A_0)$. However, simulations using this process and a time span of 400 years show that, at the speed of convergence that Barro and Sala-i-Martin (1999) find for U.S. states from 1880 to1980, namely 1.74 percent per year, the coefficient on pre-colonial population density would have to be between 100 and 1000 times smaller in absolute value than what we find, depending on the assumption of the share of labor in production. Thus, a conventional convergence model cannot explain the magnitude of our coefficient. Moreover, notice that our estimates are probably a lower bound of the true effect of pre-colonization population density on current development, given that our estimate of population density is measured with error.

colonial activities. This finding suggests that, conditional on being colonized, areas with bad activities are less developed today. Table 5 investigates this result further by running the GDP regression without areas that did not have any colonial activities. The OLS regression in Column 1, implies that, conditional on having had colonial activities, the impact of bad activities is negative and statistically significant. In turn, the impact of population density drops in size and is only marginally significant (p-value equals 0.107). These results may be contaminated by selection bias if regions that had colonial activities were different in an unobservable way from other regions. In Column 2 we estimate a Heckit model in which we control for selection bias by estimating a selection equation that determines the likelihood that a region was colonized jointly with current development[20]. Results for bad activities do not change with respect to the OLS regression (in Column 1), but the coefficient on population density increases in value and is now statistically significant. All in all, these regressions suggest that, conditional on having had colonial activities, both population density and bad colonial activities have a negative impact on development.

Figures 1 through 3 illustrate the relationship between current levels of economic development and colonial activities graphically. These figures are partial regression leverage plots for the regression in Column 5 of Table 4, which includes pre-colonial population density, colonial activities dummies and all control variables. Figure 1 shows the partial correlation between log GDP per capita and log pre-colonial population density. Figures 2 and 3 show the partial correlation between log GDP capita and good and bad colonial activities. These figures show that the identified relationship is fairly robust and is not driven by some extreme observations or observations belonging to only some countries.

In order to further examine the robustness of the results, Table 6 displays 16 different runs of the regression from Column 5 of Table 4. Each row corresponds to this regression with a different country excluded from the sample. The bottom panel of Table 6 includes summary statistics for the 16 coefficients. The estimated coefficient on pre-colonization population density is fairly robust. The coefficients on good and bad activities are never statistically significant, but they consistently display the finding that, conditional on being colonized, areas with bad activities have lower GDP per capita today than areas

[20]Even tough strictly speaking this method does not require an excluded variable in the selection equation, credible identification using this method requires using such a variable (Altonji et al., 2003). Giving that the landlocked dummy is never statistically significant in the GDP regressions and is a strong predictor for regions with none activities, we use it as the excluded variable in the selection equation.

with good activities[21]. Overall, these results imply that our main estimates are not driven by any country in particular[22].

Figure 4 provides additional evidence for our argument that good colonial activities were not always good, depending on the level of pre-colonial population density. The figure plots conditional averages of log GDP per capita, where the averages are calculated based on the coefficients from a regression that includes a good colonial activities dummy, a bad colonial activities dummy, a dummy indicating whether pre-colonial population density is above the median, and interactions of these variables. The regression also includes country dummies, as well as climate and geography controls. Standard errors were clustered at the pre-colonial population level. The conditional averages show that, in areas with low pre-colonial population density, areas with good colonial activities have higher log GDP per capita today than areas with bad colonial activities. An F-test indicates that this difference is statistically significant at the 1.1 percent level. Areas that had good colonial activities and high pre-colonial population density, however, have about the same average log GDP per capita today as areas with bad colonial activities and low pre-colonial population density. Areas that had high pre-colonial population density and bad colonial activities do even worse in terms of GDP per capita, but this difference is not statistically significant. It thus appears that having good colonial activities combined with high pre-colonial population density was about as bad for long-run economic development as having bad colonial activities.

Table 7 considers poverty rates as an alternative measure of economic development. The data set for poverty rates is slightly smaller than for GDP per capita since data on poverty rates is not available for eight Colombian regions, two Honduran regions, and one Argentinean region. Similarly to Table 4, Table 6 first shows the relationship between poverty rates and pre-colonial population density alone. Then, it displays the correlation between poverty rates and good and bad activities alone. Finally, it includes all historical variables in the same regression and also adds control variables to the

[21] F-test results are available upon request.

[22] We have performed other robustness checks that we do not report to save space.

1. Results are robust to including double and triple interactions between climate variables and altitude in order to control for the potential effects of malaria on economic development following Bleakley (2007).

2. Using data for six countries (Argentina, Brazil, Chile, Colombia, Mexico, and the US), we have run regressions in which we find that good and bad activities are not statistically correlated with current state GDP shares in mining and agriculture. Population density is negatively correlated with these shares. Therefore, it is not the case that our results are driven by a positive correlation between colonial activities and current economic activities.

regressions. All columns unambiguously show that current poverty rates are positively correlated with pre-colonial population density. The coefficients imply that going from the 25th percentile in log pre-colonial population density (-0.97) to the 75th percentile (2.10) is associated with a 16 percentage points higher poverty rate.

Areas that had good colonial activities in the past do not have higher poverty rates than areas that had no colonial activities. This result mirrors the finding from Table 4 that good colonial activities do not have higher GDP per capita than areas with no colonial activities. Similarly, here we find that areas with bad colonial activities have a negative but not statistically significant effect (equivalent to 13 percent higher poverty rate than other areas in our preferred specification) relative to areas with no colonial activities. However, areas with bad colonial activities have about 14 percent higher poverty rates than areas with good colonial activities. This is difference is statistically significant, as indicated by the F-tests at the bottom of Table 7.

Our argument relies on the fact that colonial activities changed the economic fortunes of certain areas. Before colonization, areas with higher population density and areas where bad colonial activities were to take place should not have been worse off than other areas. If those areas were worse off even before colonization, then there must be something else other than colonization patters that explains these differences. We would thus like to verify that population density and the type of future colonial activity were not correlated with economic development before colonization. This check is, however, not easily done since there are no measures of pre-colonial GDP per capita or other conventional measures of development at the region level.

To get a proxy measure of economic development, we use a health index which is available for 52 regions in six of the sixteen countries in the full sample, Brazil, Chile, Ecuador, Mexico, Peru and the US. For some countries, the index exists only for some of the regions. Moreover, some regions within the same country have the same values, since the index is not always available at the region level. For these reasons, we do not include country fixed effects in the falsification exercise. The health index was calculated based on different skeletons found in each region. These skeletons often come from different centuries. To control for possible differences in the quality of the data arising from the of age the skeletons, we add the variable “year” to the health index regression. “Year” is the average of all the estimated years in which the found bodies lived.

Table 8 shows the results of the falsification exercise. Pre-colonial population density is positively correlated with our measure of pre-colonial development. The estimated effects is only marginally significant (p-value equals 0.13), possibly because the sample is quite small. However, areas with high pre-colonial population density have lower levels of economic development today. Areas with bad colonial activities had higher levels of pre-colonial development than areas with good colonial activities, although the difference is not statistically significant. Looking at current levels of development, the result is reversed and areas with bad colonial activities have lower levels of development than areas with good activities These findings could be interpreted as indirect evidence in favor of the idea of reversals of fortune – more developed regions in the past tend to be less developed in the present, Acemoglu et al. (2002).

Overall, evidence in this section shows a strong correlation between colonial factors, in particular population density, and current levels of development. The effect of these colonial activities may operate through specific factors such as inequality, institutions, or the current ethnic composition of the population. The next section investigates this channel empirically.

6 History and Development: Looking Inside the "Black Box"

What is the channel through which colonial activities influence current levels of economic development? The hypotheses in Section 2 suggest that extractive colonial activities went along with the formation of an economic and political elite. As a result, society came to be dominated by relatively few individuals, making it difficult for others to prosper. Based on this theory, we look at two different measures, that are both related to elite dominance, as possible channels linking colonial activities to current levels of development.

The first possible channel is that extractive colonial activities led to higher inequality which led to lower GDP per capita (see also Engerman and Sokoloff who develop this argument in detail). To examine this potential mechanism, we estimate the following equation

$$I_{rc} = \mathbf{Z}_{rc}^{\prime}\alpha_I + \mathbf{X}_{rc}^{\prime}\beta_I + \theta_c + \varepsilon_{rc}, \tag{2}$$

where I is a measure of inequality. This regression also includes the vector of historical variables, $\mathbf{Z}$, and control variables, $\mathbf{X}$, as well as a country fixed effect, θ. We then assess whether variable I could explain the effects of colonial factors on development by verifying wether

$$sign\left(\widehat{\alpha}_I\right) = sign\left(\widehat{\alpha}\right) * sign\left(\frac{\partial Y}{\partial I}\right),$$

where $\frac{\partial Y}{\partial I}$ is the theoretical partial effect of variable I on economic development (Y). Engerman and Sokoloff argue that more inequality leads to lower levels of development, implying that $\frac{\partial Y}{\partial I} < 0$. Therefore, the correlation of inequality and colonial activities should have the opposite sign from the correlation of economic development and colonial activities, such that $sign\left(\widehat{\alpha}_I\right) = -sign\left(\widehat{\alpha}\right)$.

Table 9 shows regressions of the log Gini index on colonial activities. Higher pre-colonial population density is not associated with higher inequality today. Areas that had bad colonial activities are more unequal today. The correlation between colonial activities and inequality thus has the correct sign for being a possible link between colonial activities and current levels of economic development. However, the magnitude of the correlation between bad colonial activities and inequality is small relative to the correlation between bad activities and current GDP per capita. Finally, in our preferred specification, in Column 5, the difference between areas with bad colonial activities and good colonial activities is not statistically significant[23].

The second possible link between colonial activities and current economic outcomes are institutions. As discussed in Section 2, it is possible that colonial elites created institutions that benefitted predominantly the elites and not the population at large, which in turn could have lowered investment in physical and human capital. If these institutions persisted over time, they may account for the lower level of economic development today.

In order to explicitly test this argument, we need a measure of institutions at the sub-national level. To our knowledge, such a measure does not yet exist for the set of countries in our analysis. Some of the countries, such as Brazil and Mexico, have some measures or proxies for institutions at the state level. However, these measures differ from country to country and the coverage within country is often limited.

This paper thus uses an indirect approach to test whether institutions are a plausible link between colonial activities and current levels of economic development. If institutions explain the effect of colonial activities on development, then local colonial activities should have less effect on development in countries that have better institutions at the national level. Put differently, local elites in countries with good average institutions should have binding limitations on exploiting their political and economic power. Moreover, good average institutions at the country level may have led to more convergence

[23]Nunn (2008) finds evidence against the argument that inequality is the reason why colonial activities influence current levels of development. He investigates the relationship between historical slave holdings, initial land inequality and current levels of development for US states and US counties. He finds that the areas that had a higher percentage of slaves in the labor force are less developed today. However, initial land inequality is not statistically significantly related to current development. Moreover, the relationship between slavery and current development is unchanged controlling for initial inequality, suggesting that something else is the link between the two.

over time across areas with different colonial activities. Testing this claim amounts to running the following regression

$$Y_{rc} = \mathbf{Z}'_{rc}\alpha + \mathbf{Z}'_{rc}\mathbf{N}_c\gamma + \mathbf{X}'_{rc}\beta + \eta_c + e_{rc}.$$

This regression is the same as Equation (1), except that it includes the interaction term $\mathbf{Z}'\mathbf{N}$, which interactions local colonial activities, $\mathbf{Z}$, with a measure of national institutions, $\mathbf{N}$. If the reasoning above is correct, the coefficients in α should have the same sign as before, and the coefficients in γ should be positive. To facilitate the interpretation of the effects, we measure institutions as deviations from the mean value of institutions.

Table 10 presents the regressions with interaction terms. The measure of country level institutions in Column 1 is average protection against expropriation risk, 1985-1995, from the IRIS Center (University of Maryland), formerly Political Risk Services. Acemoglu et al. use the same measure of institutions. The measure runs from 0 to 10, with higher values denoting more protection against expropriation and thus better institutions. We choose this measure since it arguably is a summary measure for a larger bundle of institutions. Using the World Bank's Doing Business index of investor protection for 2004 instead produces similar results.

The main effects in Column 1 shows that pre-colonial population density is negatively related to GDP per capita. The coefficient on the interaction term is positive and significant, indicating that the magnitude of the negative relationship becomes smaller when institutions at the country level are better. Columns 2 and 3 of Table 10 address the concern that current institutions at the country level may be endogenous to levels of economic development. In column 2, instead of using a measure of current institutions, we use settler mortality from Acemoglu et al. in the interaction terms. As argued in Acemoglu et al., settler mortality is an exogenous proxy variable for current institutions, where lower settler mortality implies better institutions. Column 3 contains IV estimates, where we use settler mortality as an instrument for current institutions. The results in Columns 2 and 3 essentially mirror the findings from Column 1[24].

For all three regression, Table 10 displays F-test of the difference between the coefficients on the good and bad activities dummies and their interactions with institutions. Areas with bad activities have lower GDP per capita today, and this effect is mitigated by better institutions at the national level, although this effect is not quite statistically

[24] As an additional check to control for the potential effect of history through education levels, we control for interactions of current levels of schooling (using data from Barro and Lee, 2001) and the historical variables. The results are unchanged (Naritomi et al., 2007, find similar results).

significant (at 15 percent level) in our preferred specification in Column 3. All in all, the results in Table 10 suggest that the negative correlation between extractive colonial activities and current levels of development is mitigated by good institutions at the country level[25]. We take this as evidence for the argument that institutions are the channel that links colonial activities to current economic outcomes.

Although we argue that colonial activities and current levels of development are linked through elite dominance and institutions, there is another possible channel. Areas with bad colonial activities also had black and native slaves, and areas with high pre-colonial population had a high share of natives. These areas may thus have a higher percentage of native or black population today. This could imply that these areas have lower levels of economic development if natives and blacks face discrimination which prevents them from achieving higher levels of production.

Table 11 investigates this possible channel. The dependent variable in Column 1 is the percentage of natives and blacks combined. The coefficients show that areas with high pre-colonial population density have a lower share of natives or blacks today. Areas with bad colonial activities have a much higher share of natives and blacks than other areas. To better explain this pattern, Columns 2 and 3 split up the dependent variable into percent natives and percent blacks. The regression in Column 3 only includes 146 observations, since 11 countries in our sample don't report which fraction of the population is black, presumably because they have very few black inhabitants. The percentage of blacks is only available for Brazil, Colombia, Ecuador, Uruguay and the US, which are the countries where black slaves were more prevalent.

Column 2 shows that areas with high pre-colonial population density have fewer natives today. This estimated effect probably captures the fact that the colonizers exploited native labor more intensely in areas with many natives, leading to a bigger decline in the native population in these areas (as documented by Newson, 2006). This result contradicts the argument that areas with higher pre-colonization population density are poorer today since they have a large share of ethnic groups that face discrimination.

The results further show that areas with bad colonial activities have a higher share

[25] An additional implication of this hypothesis is that we should observe a negative effect of institutions on within-country differences of per-capita GDP, i.e. countries with good institutions should have less within country differences in development. We do not have a big data set to test this claim econometrically, but informal analyses including our 16 countries (and bigger samples) show a negative and significant correlation between the standard deviation of log GDP for the regions of a country and our country measure of institutions. Moreover, to deal with potential endogeneity problems, we run IV regressions using settler mortality as an instrument for institutions and the results imply an even bigger negative impact of institutions on the within-country variability in development. The regressions are available upon request.

of blacks than areas with no activities. Areas with good colonial activities, however, also have a higher share of blacks. The coefficients on pre-colonial population density and on the good activities dummy are not consistent with the current ethnic composition of the population being the link between colonial activities and current levels of development. If this were the correct link, both coefficients should have the opposite sign.

Overall, the results in this section suggest that institutions seem to explain the effect of colonial factors on current levels of economic development. Explanations only based on inequality or direct effects of the ethnic composition of different countries are not supported by the data.

7 Conclusion

This paper shows that within-country differences in levels of economic development in the Americas can be explained by colonial activities. In particular, it provides evidence that areas with a high supply of native labor and areas that were suitable for the exploitation of mining and plantation agriculture have lower levels of current economic development. The estimated effects are economically relevant. Our estimates imply that going from the 25th percentile in log pre-colonial population density (-1.16) to the 75th percentile (1.75) is associated with 24 percent lower GDP than the country mean and that areas that had "bad" colonial activities (i.e. mining and cash crops), have 14.7 percent lower GDP per capita today than areas that had good colonial activities within the same country. Moreover, we find that having good activities is only advantageous for long run development in areas with low pre-colonial population density. In areas with high pre-colonial population density, where colonizers often used the pre-colonial population as an exploitable resource, having good activities leads to approximately the same level of current day GDP per capita has having bad activties.

We also show that a key channel behind the correlation between colonial activities on development today is related to institutions, and not to income inequality or the current ethnic composition of the population. These results extend theoretical and empirical findings of a recent literature that investigates the effects of historical factors on institutions and development *at the country level*. Moreover, our within-country findings show that it is not only the identity (nationality) of the colonizers that matters for subsequent development, as argued by some papers. The identity of the colonizer varies across countries, but we control for country effects.

In general, our results support Engerman and Sokoloff's (1997 and 2002) argument that the type of colonial activity preformed in a region mattered greatly for the institutions in that region. Institutions in turn influence current levels of economic development. While we show that colonial activities are correlated with current economic development, it remains to investigate the channel connecting them in more detail. For the lack of measures of institutions at the region level, we use interactions with country level data on institutions to investigate the link. The results suggest that institutions are the channel. However, for future research we plan to construct region-level measures of institutions and elite dominance. This will allow us to study the link between colonial activities and current levels of development more extensively.

8 Appendix A: Variable Definitions

- PPP GDP per capita: Gross state product for each state divided by the contemporaneous population of that state and converted to PPP values using the 2000 value from the World Development Indicators. Due to data limitations, the data for Venezuela corresponds to household income.

- Poverty rate: Percentage of the population living below the poverty line, according to each country's definition of the poverty line.

- Gini index: Gini measure of income inequality for households.

- Health index: The health index measures the quality-adjusted-life-years (QALY) based on the health status attributed to skeletal remains, which display chronic health conditions and infections. The health index is adjusted for the age distribution of the population and is a simple average of seven health indicators: stature, hypoplasias, anemia, dental health (teeth and abscesses), infections, degenerative joint disease, and trauma.

- Pre-colonial population density: The ratio of the estimated pre-colonial population to the area of modern states.

- Colonial activities: Predominant economic activity performed during the colony in the region that matches the current day state.

- Average temperature: Average yearly temperature (°C)

- Total rainfall: Total yearly rainfall (mm)

- Altitude: Elevation of capital city of the state (kms)

- Landlocked dummy: This dummy is equal to one if the state does not have a sea coast.
- Percent indigenous: Percentage of the population that is indigenous for all the countries with the exception of (i) Mexico: the percentage of the population speaking an indigenous language and (ii) Peru: the percentage of indigenous or black (not only indigenous) since they are not reported separately.
- Percent black: Percentage of the population that is black (exists only for Brazil, Colombia, Ecuador, Uruguay, and the US)
- Percent indigenous or black: The sum of the pervious two variables

9 Appendix B: Pre-Colonial Population Density

This appendix describes in detail how we construct the pre-colonial population density variable. We use data from several sources to estimate pre-colonial population density at the state level. The main sources of information are region-specific chapters in Denevan (1992) and references cited in that book. This section presents the main sources for each country and explains the assumptions we used to impute population estimates for the different regions of each country. In each case we adjust the estimated size of the native population in each country to match the numbers presented in Denevan (1992, Table 00.1). Appendix Table 2 lists our pre-colonial population estimates for each region.

9.1 Argentina

The only source of information we use corresponds to Pyle (1992), a chapter in Denevan (1992). This paper includes several estimates of the native population for different regions of Argentina. We take the average of the number of natives in each region as our estimate of the denominator. In addition, using maps from the same paper, we allocate different tribes or groups to the different modern states. As some of the Argentinean regions identified in Pyle (1992) correspond to clusters of more than one modern Argentinean states, we estimated population density for the regions presented in Pyle (1992) and we impute the same population density for all the states in the same region. In particular, the regions that include more than one state are: (i) Buenos Aires and Capital Federal, (ii) Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz, and Tierra del Fuego.

9.2 Bolivia

The information for Bolivia comes from Denevan (1992) for the East of the country. We also use estimates for the South Sierra derived from Cook (1981), implying a population density of 17.3 people per square kilometer for the South Sierra. In addition, Denevan (1992, p. 228) presents his preferred estimated population figures for different regions of Northeastern Bolivia: Floodplain (14.6 people per square kilometer), Lowland Savanna, mainly Mojos (2.0), Santa Cruz area (1.8), Upland Forest (1.2), Lowland Forest (0.2), and Superhumid Upland Forest (0.1). Using estimates for the area of each state belonging to each region, we estimate population density in each state.

9.3 Brazil

The main source of information is Denevan (1992, p. 226 and 231). Denevan presents estimated population density at time of contact for different habitats in Greater Amazonia, which includes most of the Brazilian states except for portions of the coastal states in the South (Paraná, Rio Grande do Sul, Santa Catarina, and Sao Paulo). The habitats (estimated population density at contact time) considered by Denevan are: Central coast (9.5 people per square kilometer), Floodplain (14.6), Lowland–Amazon Basin (0.2), Mangrove coasts (4.75)[26], Upland and Central savannas (0.5). Using these estimates we classify each Brazilian state in each habitat and we estimate population density for the states. In the cases that a state has more than one habitat we use a weighted average considering the different habitats. In order to identify the habitats of the different regions we use information from the Natural Vegetation Map from the Perry-Castañeda Library Map Collection of the University of Texas.

For the Southern states we also use information from Denevan (1992, Table 00.1) on the total population for Southern Coastal Brazil combined (which implies a population density of 4 people per square kilometer) with the previous information on the density for the different habitats of the Greater Amazonia. Finally, we impute the population density of the state of Goias to the Federal District (Brasilia).

9.4 Chile

In the case of Chile there are no detailed estimates of population by state. Instead, there is some information on the location of several native groups, except for the Mapuche people. In this case, Cooper (1946) quoted in Denevan (1992) estimates a pre-contact

[26] For Mangrove coasts, Denevan states "probably considerably less than 9.5 per square kilometer". We use 50% of 9.5.

population of the Mapuche people of between 500,000 and 1,500,000, and we use the mean point of 1,000,000. We also know that these people were located between the fifth and the tenth region. So we estimate a pre-contact population density of 4.7. For the other regions in the country, we know the location of other people and we take the estimates of population density for these tribes in neighboring countries. In particular, we know about half of the modern first region was populated by tribes linked to the Inca empire. So we use half of the estimate we have for the Tacna region in Perú, which is equal to 1.3. For the second region, we know it was just sparely unpopulated so we use an estimate of 0.1 (similar to the estimate used by Denevan, 1992 for other sparely populated regions in Latin America). The third region was populated in part by the Diaguita people, which also lived in the Catamarca region in Argentina. So we use half of the estimate for 0.13 for the region and 0.1 for the remainder area of the region. The fourth region was populated by the Diaguita people, so we use in this case the same estimate as for Catamarca, equal to 0.17. Finally, the peoples living to the South of the tenth region were basically the same as those living in the Argentinean Patagonia, so we assume the same population density, equal to 0.01 people per square kilometer.

9.5 Colombia

We take the information on total pre-contact population for Colombia from Denevan (1992, Table 00.1). He estimates a total population of 3 million people. Using information from Ocampo (1997) and Villamarín and Villamarín (1999), we estimate population densities for 8 regions: Eastern Cordillera (13 people per square kilometer), Cauca Valley (9.2), the Caribbean Coast (2.8), Upper Magdalena (4.9), Lower Magdalena (4.3), Pasto (7.7), and Llanos (1.3). In the case of the Amazonas region, we use estimates for the Brazilian amazonas from Denevan (1992), which are equal to 0.2 people per square kilometer. Next, we classify each modern state in one of these regions accordingly to the Colombian maps of the Perry-Castañeda Library Map Collection of the University of Texas. Finally, the San Andrés, Providencia and Santa Catalina islands we use population density for the Caribbean islands from Denevan (1992).

9.6 Ecuador

Estimates for Ecuador are very sparse, and we apply estimates for neighboring countries and complement them with some information available in Vieria Powers (1995) for the coastal regions. We classify each state into the following regions: Central Andes (for which we use an estimated population density of 12.1 people per square kilometer, which is the average for similar regions in Colombia and Perú), Coast (for which use estimates from Viera Powers that range from 1 to 2 people per square kilometer), Upland Forest (1.2, from Denevan), and East (0.7 from similar regions in Colombia and Perú). Using estimates for the area of each state belonging to each region, we estimate population density in each state.

9.7 El Salvador

Denevan (1992, p. 38) argues that population in Central America was mainly located in the plain regions close to the Pacific coast "...where there were rich volcanic soils from Guatemala to Costa Rica, and also in Panamá". Thus, for all Central American countries we keep this stylized fact in mind in order to assign populations to different regions. In addition, Denevan gives an estimate of the total population living in El Salvador before contact with colonizers of about 500,000. Thus, we classify all states in two regions: Coast and Mountains. In the case of population density for mountains we use 0.01 people per square kilometer and for the Coastal regions we use a population density of 39.3 people per square kilometer, so that we generate a total population of 500,000. As for other countries, using estimates for the area of each state belonging to each region, we estimate population density in each state.

9.8 Guatemala

As for El Salvador, we take advantage of the estimate of the total population from Denevan (1992, p. 291). In this case Denevan gives an estimate of 2,000,000. To distribute this population in the states we proceed as follows. First, we consider the state of Petén and parts of the Norte and Noroccidente states. For these states we use a population density of 5.63 people per square kilometer, which corresponds to the simple average of the population density of the Mexican state of Campeche and the estimated population density for Belize. Second, we assign a population density of 23.60 to all areas on the Coast (which correspond to parts of the states of Central, Suroriente, and Suroccidente), where the value 23.60 is our estimate for the state of Ahuachapán in Salvador. This leaves us with a total estimated population of about 500,000 people. The remaining population corresponds to the highlands, which were populated by Mayan tribes (such as the Cakchiquel and the Quiché). Thus, we assign 29.05 people per square kilometer to these areas, so as to arrive at the total population estimated in Denevan.

9.9 Honduras

As for El Salvador and Guatemala, we take advantage of the estimate of the total population from Denevan (1992, p. 291), which is 750,000 for both Honduras and Belize. We assume a similar population density in both areas and therefore, we get a total estimated population of 622,843 people for Honduras. To distribute this population across the states we proceed as follows. First, we consider the coastal states of Choluteca and Valle and parts of the state of El Paraíso. For these areas, we apply a population density of 17.70, which corresponds to the simple average of the coastal states of La Unión and Morazán in El Salvador. This leaves us with a total estimated population of about 220,000 people. The remaining population corresponds to the eastern regiones of the country, which were populated by several peoples, such as the Lencas. Thus, we apply an estimate of 8.19 people per square kilometer to these areas, to get the total population estimated in Denevan.

9.10 Mexico

Estimates for Central Mexico come from Sanders (1992), in particular for Mexico, DF, Hidalgo, Puebla, Tlaxcala, Tamaulipas, and Morelos. In addition, Denevan (1992) presents population estimates for the following regions: (i) Baja California Norte and Sur; (ii) Campeche, Quintana Roo, and Yucatán; (iii) Chiapas; (iv) Chihuahua, Durango, Sinaloa, and Sonora; (v) Coahuila de Zaragoza and Nuevo León; (vi) Colima, (vii) and Tabasco. In the cases in which a region includes more than one state, we impute the same population density for each region. As in all the other cases, we adjust the population estimates so to match the total estimate for Mexico from Denevan (1992, Table 00.1).

9.11 Panamá

As for all other Central American countries, we take advantage of the information that coastal areas were more densely populated. In this case, we use a population density of 0.01 people per square kilometer in the mountain areas. For the coastal regions we apply a population density of 30.88 people per square kilometer, so that we generate the total population of 1,000,000 estimated by Denevan (1992, p. 291). Using estimates for the area of each state belonging to each region, we estimate population density in each state.

9.12 Paraguay

Estimates of the total population for Paraguay, Uruguay, and the South of Brazil in Denevan (1992, p. 291) imply a population density of 0.9 people per square kilometer. We use this estimate and estimates for neighboring regions in Argentina, Bolivia, and Brazil, as benchmarks to estimate population density in different regions. In particular, for Alto Paraguay we use the average population density of Santa Cruz (Bolivia) and Matto Grosso do Sul (Brazil). For Alto Paraná and Caaguazú, we use the estimated population density for the interior areas of neighboring Paraná (Brazil). For Amambay, we just the estimate from Matto Grosso so Sul (Brazil). For Asunción, Central, and Cordillera, we use weighted averages of the Argentinian regions of Corrientes and Formosa. For Boquerón we use population density from the Chaco region in Argentina. For Caazapá and Guairá we use the simple average of the estimates for Alto Paraná and Misiones (Argentina). For Canindeyú we also use estimates for Alto Paraná, but in this case we take the simple average with population density for Matto Grosso do Sul. For Concepción, we take the simple average of Matto Grosso do Sul and Chaco. For Itapúa we use the simple average of Rio Grande do Sul (Brazil) and Misiones (Argentina). For Misiones we use the average of the Argentinean states of Corrientes and Misiones. For Ñeembucú, we use a weighted average of estimates for Formosa and Chaco in Argentina. For Paraguarí, we use the average of estimates for Misiones (Paraguay) and Central. For Presidente Hayes we apply the estimates from Formosa (Argentina). And, finally, for San Pedro we take the average of Presidente Hayes and Canindeyú. All these estimates imply a population density of 0.9, similar to those implied in Denevan´s calculations.

9.13 Perú

The information for Perú comes from Cook (1981) for most of the regions in the country and from Denevan (1992) for the East of the country. In particular, Cook (1981, p. 96) presents his preferred estimated population figures for six different Peruvian regions: North coast, Central coast, South coast, North sierra, Central sierra, and South sierra. From Denevan (1992, pp. 228), we estimate the population density for six regions located in the East of the country: Amazonas (50% of the area), Loreto, Madre de Dios, Puno (50% of the area), and Ucayali.

9.14 United States

The raw information on the native population of the United States comes from Ubelaker (1992). This paper presents information on the native population of all the tribes in the United States and the location of these tribes (see Map 8.1, p. 244). Using this information we assign each tribe to the modern US states and in this way we estimate pre-contact population densities. In some cases it was impossible to estimate population densities for specific states because some tribes lived in more than one state so we present population density estimates for groups of modern states. This is the case for: 1. Arizona and New Mexico; 2. Delaware and New Jersey; 3. Rhode Island and Massachusetts; 4. Maryland and Washington D.C.; and 5. Virginia and West Virginia.

9.15 Uruguay

First, we consider a number of regions for which there was no evidence of being settled by natives. The states of Artigas, Flores, Florida, Lavallejana, Montevideo, Rivera, Canelones, Maldonado, and San José fall into this category. We assign a population density of 0.01 people per square kilometer to all these states. Next, we consider regions in which there was some evidence of settlements by some peoples, such as the Gueonas, Chaná, Bohan, and Charrua. These states are Cerro Largo, Colonia, Paysandú, Rocha, Salto, Tacuarembo, and Treinta y Tres, and we assign them a population density of 0.05 people per square kilometer. Finally, the remaining three states of Durazno, Soriano, Río Negro were more heavily settled by peoples such as the Yaros, Chaná, and Charruas, and we assign them a weighted average of population density estimated for Entre Ríos (Argentina), where the weights are increasing in the area closer to this region.

9.16 Venezuela

Denevan (1992) presents estimates for the total pre-contact population of Venezuela and gives pre-contact population densities for the Orinoco llanos (1.3 people per square kilometer), Amazon Basin (0.2), and Guiana Highlands (less than 0.5 people per square kilometer, we use 0.4). In order to get estimates for the other regions of Venezuela, first we use estimates available from other countries with similar habitats and native groups in the region (in particular, from North and East Colombia and the Caribbean) in the following way: 1. the Caribbean Coast: we use estimates for the same habitat in the Colombian Caribbean Coast; 2. the Selva: we use estimates for the same habitat in Colombia, and 3. the Caribbean (the Dependencias Federales region): we use estimates from Denevan for the Caribbean islands. Finally, we estimate population density for the Coastal Ranges and the Eastern Andes by choosing a pre-contact population density that matches the total population of about 1,000,000 people for Venezuela, as presented in Denevan (1992, Table 00.1).

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Figure 1 – Partial Correlation Between Log GDP per Capita and Log Pre-colonial Population Density (All Controls)

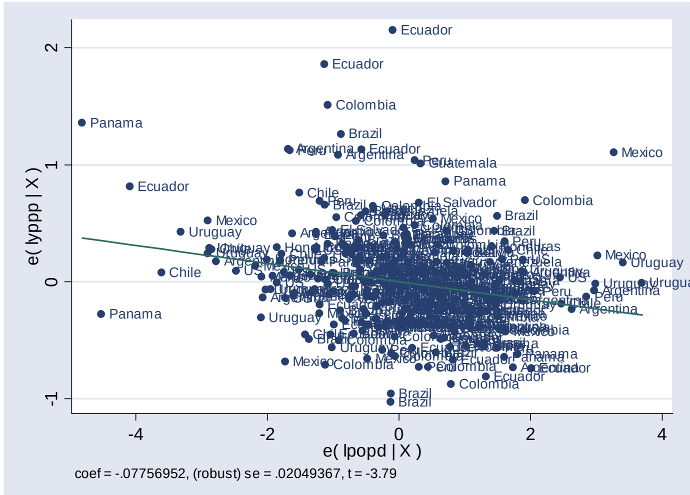


Figure 2 – Partial Correlation Between Log GDP per Capita and Good Activities (All Controls)

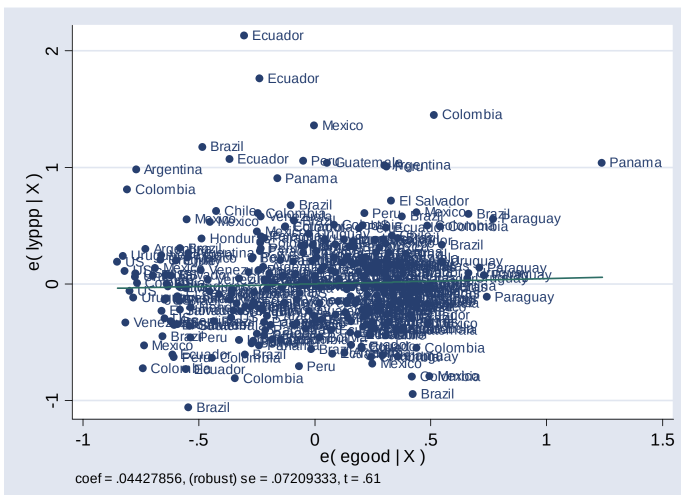


Figure 3 – Partial Correlation Between Log GDP per Capita and Bad Activities (All Controls)

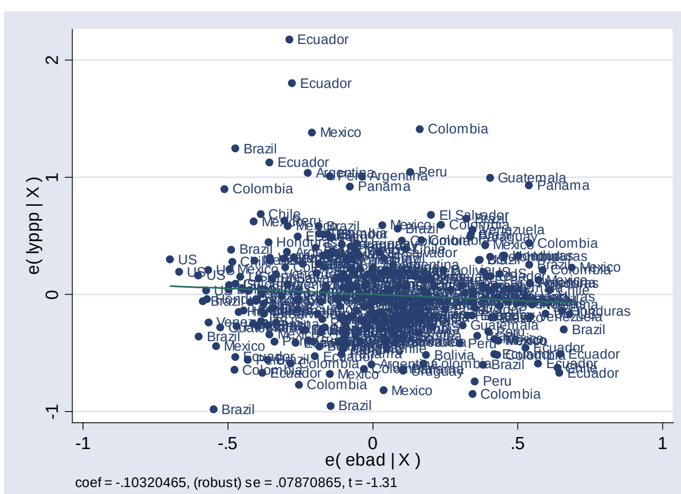
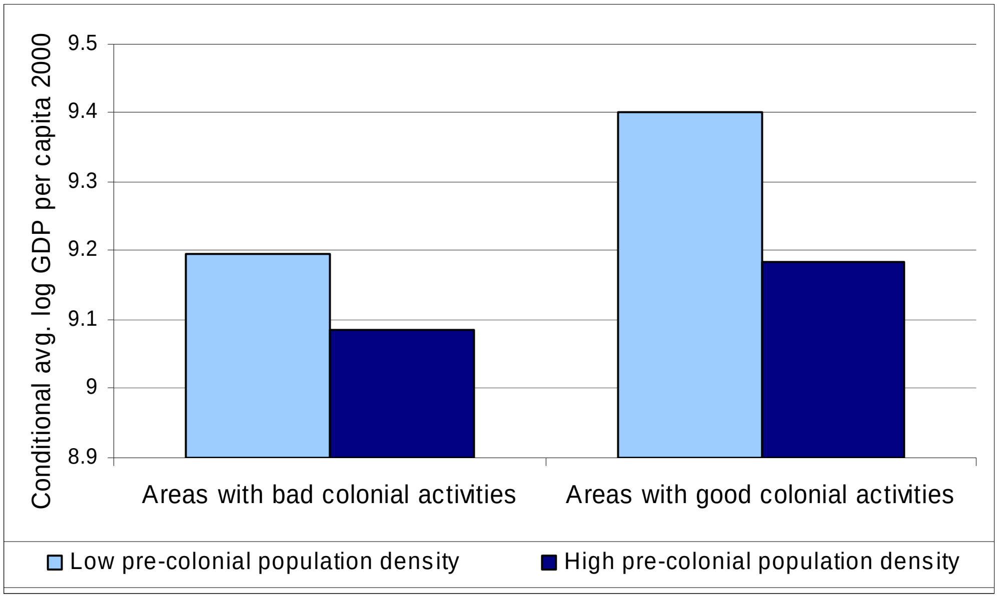


Figure 4 – 2000 GDP per Capita by Colonial Activities and Population Density



Note: Low and high pre-colonial population density are defined as below and above the median. The averages are calculated based on the coefficients from a regression that includes a good colonial activities dummy, a bad colonial activities dummy, a dummy indicating whether pre-colonial population density is above the median, and interactions of these variables. It also includes country dummies, as well as climate and geography controls. Standard errors were clustered at the pre-colonial population level.

Table 1: Regional PPP GDP per Capita Across the Americas

Country	Obs	Mean	Log S.D.	Min	Max	Ratio ymax/ymin
Argentina*	24	11706	0.553	4578	40450	8.84
Bolivia	9	2715	0.395	1245	4223	3.39
Brazil	27	5754	0.576	1793	17596	9.81
Chile	13	8728	0.423	4154	19820	4.77
Colombia	30	5869	0.489	2368	22315	9.43
Ecuador	22	5058	0.834	1458	26574	18.23
Salvador	14	3237	0.286	2191	5954	2.72
Guatemala	8	3563	0.439	2100	8400	4.00
Honduras	18	2108	0.140	1716	2920	1.70
Mexico	32	8818	0.461	3664	23069	6.30
Panama	9	4336	0.676	1805	12696	7.04
Paraguay	18	4513	0.293	2843	7687	2.70
Peru	24	3984	0.570	1287	13295	10.33
US	48	32393	0.179	22206	53243	2.40
Uruguay	19	6723	0.231	3902	10528	2.70
Venezuela**	19	5555	0.231	3497	9088	2.60

*Data for 1993, **Income data

Table 2: Summary Statistics

Outcome variables	Obs	Mean	Std. Dev.	Min	Max
Log PPP GDP per capita	332	8.75	0.90	7.13	10.88
Log poverty rate	321	2.93	0.93	0.21	4.40
Health Index	52	4.24	0.34	2.95	4.52
Log Gini	258	-0.74	0.15	-1.15	-0.46
Percent native or black	217	9.95	16.27	0.09	138.86
Percent native	275	8.48	16.66	0.01	85.24
Percent black	146	6.58	9.23	0.00	65.66
Historical variables					
Log pre-colonial population density	332	0.31	2.31	-6.91	5.97
Good activities dummy	332	0.47	0.50	0	1
Bad activities dummy	332	0.22	0.42	0	1
Control variables					
Avg. temperature	332	19.97	5.83	2.38	29
Total rainfall	332	1.28	0.95	0.00	8.13
Landlocked dummy	332	0.57	0.50	0	1
Altitude	332	0.66	0.92	0	4.33

Table 3: Predicting Colonial Activities

	Dependent variable:		
	Good acivities	Bad activities	No activities
	(1)	(2)	(3)
Log pre-colonial pop dens	0.089	-0.003	-0.086
	[0.023]***	[0.017]	[0.022]***
Avg. temperature	-0.091	0.085	0.006
	[0.032]***	[0.024]***	[0.029]
Avg. temp. squared	0.002	-0.002	0
	[0.001]***	[0.001]***	[0.001]
Total rainfall	-0.028	-0.028	0.055
	[0.064]	[0.059]	[0.070]
Total rainfall squared	-0.008	0.011	-0.003
	[0.010]	[0.008]	[0.013]
Landlocked dummy	-0.007	-0.158	0.166
	[0.075]	[0.058]***	[0.070]**
Altitude	0.201	-0.077	-0.124
	[0.102]**	[0.090]	[0.079]
Altitude squared	-0.088	0.078	0.01
	[0.030]***	[0.026]***	[0.022]
Observations	332	332	332
R squared	0.19	0.21	0.26

Robust standard errors (clustered at pre-colonial population density level) in brackets. Regressions include country fixed effects. Significance levels: * 10%, ** 5%, *** 1%

Table 4: Colonial Activities and Current GDP per Capita

	Dependent variable: Log PPP GDP per capita				
	(1)	(2)	(3)	(4)	(5)
Log pre-colonial pop density	-0.078***		-0.081***	-0.083***	-0.078***
	[0.024]		[0.023]	[0.022]	[0.021]
Good activities dummy		-0.020	0.067	0.049	0.044
		[0.088]	[0.075]	[0.074]	[0.071]
Bad activities dummy		-0.178*	-0.102	-0.129	-0.103
		[0.092]	[0.083]	[0.083]	[0.078]
Avg. temperature				0.030	0.026
				[0.035]	[0.031]
Avg. temp. squared				-0.001	-0.001*
				[0.001]	[0.001]
Total rainfall				-0.174**	-0.167**
				[0.086]	[0.084]
Total rainfall squared				0.021	0.018
				[0.020]	[0.020]
Altitude (per km)					-0.114
					[0.109]
Altitude squared					-0.016
					[0.036]
Landlocked dummy					-0.086
					[0.065]
Observations	332	332	332	332	332
R-squared	0.77	0.76	0.77	0.78	0.79
F test: Good = Bad	-	6.25	7.40	7.39	5.48
P-value	-	0.013	0.007	0.007	0.020

Robust standard errors (clustered at pre-colonial population density level) in brackets.
Regressions include country fixed effects. Significance levels: * 10%, ** 5%, *** 1%

Table 5: Colonial Activities and Current GDP per Capita - Excluding Regions without Colonial Activities

	Dependent Variable: Log PPP GDP per capita	
	(1)	(2)
Log Population	-0.043	-0.058
	[0.026]	[0.033]*
Bad Activities	-0.137	-0.134
	[0.061]**	[0.059]**
Average Temperature	0.059	0.063
	[0.027]**	[0.027]**
Av. Temperature squared	-0.002	-0.002
	[0.001]***	[0.001]***
Rainfall	-0.126	-0.118
	[0.072]*	[0.070]*
Rainfall squared	0.003	0.003
	[0.010]	[0.010]
Altitude	-0.107	-0.163
	[0.119]	[0.100]
Altitude squared	-0.01	-0.002
	[0.036]	[0.031]
Landlocked	-0.084	
	[0.075]	
Observations	230	332
R-squared	0.85	
Estimation technique	OLS	Heckit

Robust standard errors in brackets * significant at 10%; ** significant at 5%; *** significant at 1%

Table 6: Colonial Activities and Current GDP per Capita - Excluding Countries

	Dependent variable: Log PPP GDP per capita				
Country excluded	Log pre-col pop dens	Good Activities	Bad Activities	Observations	R-squared
Argentina	-0.067	0.081	-0.085	308	0.8
	[0.023]***	[0.071]	[0.080]		
Bolivia	-0.079	0.041	-0.104	323	0.79
	[0.021]***	[0.070]	[0.078]		
Brazil	-0.075	0.026	-0.131	305	0.81
	[0.022]***	[0.071]	[0.081]		
Chile	-0.078	0.056	-0.084	319	0.8
	[0.023]***	[0.073]	[0.080]		
Colombia	-0.071	0.087	-0.076	302	0.83
	[0.022]***	[0.065]	[0.069]		
Ecuador	-0.062	0.081	-0.024	310	0.83
	[0.020]***	[0.066]	[0.070]		
Salvador	-0.077	0.033	-0.111	320	0.79
	[0.021]***	[0.074]	[0.079]		
Guatemala	-0.078	0.041	-0.128	324	0.8
	[0.021]***	[0.071]	[0.078]		
Honduras	-0.077	0.037	-0.129	314	0.78
	[0.022]***	[0.075]	[0.082]		
Mexico	-0.092	0.066	-0.093	300	0.81
	[0.021]***	[0.072]	[0.085]		
Panama	-0.07	0.017	-0.121	323	0.8
	[0.019]***	[0.068]	[0.077]		
Paraguay	-0.076	0.033	-0.111	314	0.8
	[0.021]***	[0.075]	[0.080]		
Peru	-0.073	0.025	-0.093	308	0.8
	[0.022]***	[0.075]	[0.083]		
US	-0.083	0.066	-0.096	284	0.55
	[0.025]***	[0.081]	[0.095]		
Uruguay	-0.091	0.05	-0.099	313	0.8
	[0.025]***	[0.076]	[0.081]		
Venezuela	-0.077	0.053	-0.107	313	0.8
	[0.021]***	[0.074]	[0.081]		
None	-0.078	0.044	-0.103	332	0.79
	[0.021]***	[0.071]	[0.078]		
Statistics	Log pre-col pop dens	Good Activities	Bad Activities	Observations	R-squared
Average	-0.077	0.050	-0.100	311	0.787
Median	-0.077	0.046	-0.102	313	0.800
Max	-0.062	0.087	-0.024	332	0.83
Min	-0.092	0.017	-0.131	284	0.55

Table 7: Colonial Activities and Current Poverty Rates

	Dependent variable: Log poverty rate				
	(1)	(2)	(3)	(4)	(5)
Log pre-colonial pop density	0.054**		0.057**	0.054**	0.048**
	[0.027]		[0.025]	[0.023]	[0.022]
Good activities dummy		-0.015	-0.075	-0.034	-0.015
		[0.090]	[0.077]	[0.077]	[0.066]
Bad activities dummy		0.175*	0.122	0.157*	0.127
		[0.095]	[0.085]	[0.088]	[0.082]
Avg. temperature				0.002	0.02
				[0.043]	[0.035]
Avg. temp. squared				0	0.001
				[0.001]	[0.001]
Total rainfall				0.267***	0.253***
				[0.082]	[0.077]
Total rainfall squared				-0.027*	-0.022
				[0.015]	[0.014]
Altitude					0.02
					[0.121]
Altitude squared					0.062*
					[0.034]
Landlocked					0.181**
					[0.075]
Observations	321	321	321	321	321
R-squared	0.76	0.76	0.77	0.79	0.82
F test: Good = Bad	-	7.03	7.94	7.21	4.87
P-value	-	0.009	0.005	0.008	0.029

Robust standard errors (clustered at pre-colonial population density level) in brackets. Regressions include country fixed effects. The data set is smaller than in Table 4 since data on poverty rates is not available for eight Colombian regions and one Argentinean region. Significance levels: * 10%, ** 5%, *** 1%

Table 8: Colonial Activities and Pre-Colonial Development

	Dependent variable:	
	Log health index	Log PPP GDP per capita
	(1)	(2)
Log pre-colonial pop dens	0.079	-0.125
	[0.052]	[0.079]
Good activities dummy	-0.207	-0.209
	[0.164]	[0.314]
Bad activities dummy	-0.007	-0.315
	[0.123]	[0.385]
Log data year	-0.125	
	[0.143]	
Observations	52	52
R-squared	0.3	0.69
F test: Good = Bad	1.66	0.28
Prob	0.202	0.600

Robust standard errors (clustered at pre-colonial population density level) in brackets. Regressions include control variables. Health index is a proxy of pre-colonial development. The health index regression controls for the year for which the health index is observed to control for differences in the quality of the index. Significance levels: * 10%, ** 5%, *** 1%

Table 9: Colonial Activities and Current Income Inequality

	Dependent variable: Log Gini				
	(1)	(2)	(3)	(4)	(5)
Log pre-colonial pop density	0.005		0.003	0.002	-0.001
	[0.008]		[0.008]	[0.008]	[0.008]
Good activities dummy		0.009	0.004	0.005	0.004
		[0.015]	[0.012]	[0.012]	[0.012]
Bad activities dummy		0.041	0.037**	0.036**	0.026
		[0.018]**	[0.015]	[0.015]	[0.015]*
Avg. temperature				0.007**	0.009
				[0.004]	[0.005]*
Avg. temp. squared				-0.000*	0
				[0.000]	[0.000]
Total rainfall				0.005	0.006
				[0.021]	[0.021]
Total rainfall squared				-0.002	-0.001
				[0.004]	[0.004]
Altitude					0.017
					[0.025]
Altitude squared					0.004
					[0.009]
Landlocked dummy					-0.012
					[0.011]
Observations	258	258	258	258	258
R-squared	0.7	0.71	0.71	0.71	0.72
F test: Good = Bad	-	5.66	5.82	5.33	2.40
P-value	-	0.018	0.017	0.022	0.123

Robust standard errors (clustered at pre-colonial population density level) in brackets. Regressions include country fixed effects. The data set is smaller than in Table 4 since data on poverty rates is not available for eight Colombian regions and two Argentinean regions. Significance levels: * 10%, ** 5%, *** 1%

Table 10: Colonial Activities and Institutions

	Dependent variable: Log PPP GDP per capita		
	(1)	(2)	(3)
Log pre-colonial pop dens	-0.096	-0.078	-0.092
	[0.023]***	[0.022]***	[0.025]***
Good activities dummy	0.064	0.05	0.063
	[0.071]	[0.075]	[0.082]
Bad activities dummy	-0.092	-0.107	-0.108
	[0.087]	[0.089]	[0.097]
Log pop dens*Country institutions	0.046		0.041
	[0.013]***		[0.018]**
Good activities*Country institutions	-0.035		-0.036
	[0.030]		[0.045]
Bad activities*Country institutions	0.008		0.034
	[0.039]		[0.041]
Log pop dens*Country settler mortality		-0.073	
		[0.033]**	
Good activities*Country settler mortality		0.068	
		[0.085]	
Bad activities*Country settler mortality		-0.071	
		[0.085]	
Observations	332	332	332
R-squared	0.8	0.8	-
F test: Good = Bad	4.8	5.37	5.49
P-value	0.030	0.022	0.020
F test: Good*Country institutions = Bad*Country institutions	1.02	1.94	2.06
P-value	0.314	0.165	0.153
Estimation method	OLS	OLS	IV

Robust standard errors (clustered at pre-colonial population density level) in brackets. Regressions include country fixed effects and control variables. Country institutions is a measure of protection against expropriation risk. In Column (3), settler mortality is the instrument for country instiutions, from Acemoglu et al (2001). Significance levels: * 10%, ** 5%, *** 1%

Table 11: Colonial Activities and Ethnicity of Current Population

	Dependent variable:		
	Percentage native or black	Percentage native	Percentage black
	(1)	(2)	(3)
Log pre-colonial pop density	-1.567	-0.709	-0.576
	[0.473]***	[0.325]**	[0.383]
Good activities dummy	0.796	-1.55	2.404
	[1.671]	[1.376]	[1.429]*
Bad activities dummy	5.576	-1.938	7.082
	[1.964]***	[1.902]	[1.606]***
Observations	217	275	146
R-squared	0.57	0.6	0.64
F test: Good = Bad	4.99	0.05	6.61
P-value	0.027	0.830	0.012

Robust standard errors (clustered at pre-colonial population density level) in brackets. Regressions include country fixed effects and control variables. Significance levels: * 10%, ** 5%, *** 1%

Appendix A - Table A1: Data Sources

Variable	Argentina	Bolivia	Brazil	Chile
GDP	INDEC - Dirección de Cuentas Nacionales - PBG por provincia y sector de actividad económica	Instituto Nacional de Estadísticas de Bolivia - PIB departamental	IBGE - Contas Regionais	Central Bank of Chile
Population	INDEC - Censo Nacional de Población, Hogares y Viviendas 2001	Instituto Nacional de Estadísticas de Bolivia - Censo 2001	IBGE - Censo Demográfico 2000	MIDEPLAN projections based on 2002 Census
Poverty rate	INDEC - EPH - May 2001	Instituto Nacional de Estadísticas de Bolivia - MECOVI 1999	http://tabnet.datasus.gov.br/cgi/idb2004/b05uf.htm	MIDEPLAN - 2000 CASEN
GINI index	Own calculations from 1998 EPH	Calvo (2000)	IBGE - Censo Demográfico 2000	Own calculations from 2000 CASEN
Health index	Backbone of History Project (Steckel and Rose, 2002)			
Pre-colonial population density	Own calculations from Pyle (1992)	Own calculations from Denevan (1992)	Own calculations from Denevan (1992)	Own calculations from Denevan (1992)
Colonial acitvities	Brown (2003), Rock (1987)	Peñaloza (1981), Arze Aguirre (1996), Klein (2003), Serrano (2004)	Bethell (1987), Burns (1993)	Collier and Sater (2004)
Temperature	Servicio Metereológico Nacional	Servicio Nacional de Meteorología e Hidrología	IBGE - Annuário estatístico do Brazil.	Dirección Metereológica de Chile
Rainfall	Servicio Metereológico Nacional	Servicio Nacional de Meteorología e Hidrología	IBGE - Annuário estatístico do Brazil.	Dirección Metereológica de Chile
Altitude	Global Gazetteer Version 2.1 (www.fallingrain.org)			
Indigenous or black population	INDEC - Censo Nacional de Población, Hogares y Viviendas 2001	Instituto Nacional de Estadísticas de Bolivia - Censo 2001	IBGE - Censo Demográfico 2000	Own calculations from 2000 CASEN

Variable	Colombia	Ecuador	El Salvador	Guatemala
GDP	DANE - Cuentas Departamentales	Banco Central del Ecuador - Cuentas Provinciales	Informe del Desarrollo Humano El Salvador (2005)	Informe del Desarrollo Humano Guatemala (2002)
Population	DNP projections - 2000	Instituto Nacional de Estadísticas y Censos, 2001 Census	Dirección General de Estadísticas y Censos, projections 2005	Informe del Desarrollo Humano Guatemala (2002)
Poverty rate	SISD	Informe sobre Desarrollo Humano, Ecuador 2001. PNUD	Compendio Estadistico	Informe Nacional de Desarrollo Humano Guatemala (2005)
GINI index	SISD	Informe sobre Desarrollo Humano, Ecuador 2001. PNUD	Informe sobre Desarrollo Humano, El Salvador 2005. PNUD.	Informe Nacional de Desarrollo Humano Guatemala (2003)
Health index	Backbone of History Project (Steckel and Rose, 2002)			
Pre-colonial population density	Own calculations from Denevan (2002), Ocampo (1997), and Villamarín (1999)	Own calculations from Denevan (1992)	Own calculations from Denevan (1992)	Own calculations from Denevan (1992)
Colonial acitvities	McFarlane (1993), Ocampo (1997)	Reyes, Oscar Efren (1965); Padre Juan de Velasco (1960)	Rodriguez Becerra, Salvador (1977); Torrer-Rivas, Edelberto (1993)	Webre, Stephen (1989); Jiménez, Alfredo (1997)
Temperature	IDEAM	Instituto Nacional de Meteorología e Hidrología	Servicio Nacional de Estudios Territoriales - Perfiles Climatológicos	Instituto Nacional De Sismologia, Vulcanología, Meteorología E Hidrologia
Rainfall	IDEAM	Instituto Nacional de Meteorología e Hidrología	Servicio Nacional de Estudios Territoriales - Perfiles Climatológicos	Instituto Nacional De Sismologia, Vulcanología, Meteorología E Hidrologia
Altitude	Global Gazetteer Version 2.1 (www.fallingrain.org)			
Indigenous or black population	DANE	CEPAL (2005)	-	Informe Nacional de Desarrollo Humano Guatemala (2005)

Variable	Honduras	Mexico	Panama	Paraguay
GDP	Informe del Desarrollo Humano Guatemala (2002)	INEGI - Producto Interno Bruto por Entidad Federativa	Dirección de Estadísticas y Censos, PIB Provincial	Atlas de Desarrollo Humano Paraguay 2005
Population	Informe del Desarrollo Humano Guatemala (2002)	INEGI - Censo General de Población y Vivienda 2000	Dirección de Estadísticas y Censos, 2000 Census	Dirección General de Estadísticas, Encuestas y Censos
Poverty rate	Informe sobre Desarrollo Humano 2002. PNUD	SEDESOL	Ministerio de Economia y Finanzas, Republica de Panama (2005)	Robles (2001)
GINI index	-	Own calculations from 2000 ENE	-	-
Health index	Backbone of History Project (Steckel and Rose, 2002)			
Pre-colonial population density	Own calculations from Denevan (2002)	Own calculations from Denevan (2002) and Sanders (2002)	Own calculations from Denevan (2002)	Own calculations from Denevan (2002)
Colonial acitvities	Torrer-Rivas, Edelberto (1993); Jiménez, Alfredo (1997)	Cumberland (1968), Gerhard (1979), Hamnett (1999), Knight (2002), Zabre (1969)	Ots y Capdequí (1810)	Lugones (1985), Rivarola (1986), Armani (1988)
Temperature	Servicio Metereológico Nacional	INEGI	Dirección de Meteorología	Grassi et al. (2004)
Rainfall	Servicio Metereológico Nacional	INEGI	Dirección de Meteorología	Grassi et al. (2005)
Altitude	Global Gazetteer Version 2.1 (www.fallingrain.org)			
Indigenous or black population	-	INEGI - Censo General de Población y Vivienda 2000	-	-

Variable	Peru	US	Uruguay	Venezuela
GDP	INEI - Dirección Nacional de Cuentas Nacionales - PBI por departamento.	BEA - Gross Domestic Product by State	Anuario Diario El País 2001	Own calculations from 1998 EHM (household income)
Population	INEI	U.S. Census Bureau	Instituto Nacional de Estadística de Uruguay	INE
Poverty rate	INEI	State and Metropolitan Area Data Book 1997-1998	Desarrollo Humano en Uruguay 2001. PNUD	INE
GINI index	Own calculations from 2000 ENAHO	U.S. Census Bureau, Table S4	-	Own calculations from 1998 EHM
Health index	Backbone of History Project (Steckel and Rose, 2002)			
Pre-colonial population density	Own calculations from Denevan (2002) and Cook (1981)	Own calculations from Ubelaker (2002)	Own calculations from Denevan (2002)	Own calculations from Denevan (2002)
Colonial acitvities	Fisher (1970), Dobyns and Doughty (1976)	Andrews (1914), Eccles (1972), McCusker and Menard (1985)	Bauza, Francisco (1895); Rubio, Julián María (1942)	Lombardi (1982)
Temperature	INEI	http://www.met.utah.edu/jhorel/html/wx/climo.html	Wikipedia.org	INE
Rainfall	INEI	http://www.met.utah.edu/jhorel/html/wx/climo.html	Wikipedia.org	INE
Altitude	Global Gazetteer Version 2.1 (www.fallingrain.org)			
Indigenous or black population	INEI	U.S. Census Bureau, Population Division	Bucheli and Cabela (2006)	INE - 2001 Census